CLAIMS

I claim:

1. An ion detector for a time-of-flight mass spectrometer comprising at least two anodes wherein said anodes detect different fractions of incoming ions.

2. An ion detector according to claim 1, wherein the size of at least one anode differs from the size of at least one other anode.

3. An ion detector according to claim 1, wherein a variable electrical potential on at least one anode modifies incoming ion flight paths such that the anodes detect different fractions of the incoming particles.

4. An ion detector according to claim 1, wherein a variable magnetic field in the detector modifies incoming ion flight paths such that the anodes detect different fractions of the incoming particles.

5. An ion detector according to claim 1, wherein the ion detector geometry causes the anodes to detect different fractions of the incoming particles.

6. A method for creating an ion spectrum in a time-of-flight mass spectrometer comprising:

(a) recording histograms from at least two anodes wherein said anodes detect different fractions of incoming ions;

(b) determining which regions of the histogram recorded by at least one anode that detects a larger fraction of incoming ions are saturated;

(c) creating spectra for saturated regions by applying a weighting factor to the histogram recorded by the anode that detects a smaller fraction of incoming ions;

(d) creating spectra for unsaturated regions using unweighted histograms; and

(e) merging said spectra to form said final ion spectrum.

7. The method of claim 5 wherein said saturation determining step further comprises treating certain regions as saturated based upon an expected mass distribution of a sample.

8. The method of claim 5 where said saturation determining step further comprises comparing the histograms recorded by said anodes on a region by region basis to create histogram ratios for each region and designating a region as saturated when its histogram ratio differs substantially from the histogram ratios for other regions.

9. The method of claim 5 wherein said anode fraction is determined theoretically based upon the anode sizes, anode electrical potentials, ion detector magnetic fields, and ion detector geometry.

10. The method of claim 5 wherein said anode fraction is determined empirically by comparing histogram peaks for semi-abundant species which are not so abundant as to cause saturation on the histogram of the large fraction anode but are still sufficiently abundant so as to register a meaningful result on the small fraction anode.